JOURNAL

OF THE

AMERICAN FOUNDRYMEN'S

ASSOCIATION.

VOL. 2. MARCH, 1897. NO. 9

The American Foundrymen's Association is not responsible for any statement or opinion that may be advanced by any contributor to this Journal.

PROCEEDINGS OF THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

The sixty-fifth meeting of the Foundrymen's Association was held on Wednesday, February 3, at the Manufacturers' Club in Philadelphia. President P. D. Wanner was the chairman.

Secretary Howard Evans read the report of the executive committee as follows:

There is nothing to report that is very encouraging regarding the foundry trade in this district, but there are indications of improvement in this vicinity, notwithstanding the reports to the contrary from other sections of the country. The users of castings seem to be getting ready, and we trust it will not be long before there will be a permanent improvement. This will be a pleasure to report when general activity is perceptible. The National Association of Manufacturers has just held its second annual convention in this city, which brought together numbers of manufacturers, representing all lines in different parts of this country. The real purpose of this meeting was to extend our trade in every direction and to open up trade with foreign coun-

tries. We find in our midst a number of foundries who have already picked up quite a large trade with foreign countries. We hear it is a fact that pig iron is being made in the southern states and shipped to Great Britain. Machinery and locomotives have been shipped to all parts of the world, and now we hear of small castings and malleable work being exported to the south and east of us to foreign countries. This is very encouraging, and if we can keep this great and prosperous country at work by shipping our surplus to foreign shores, the benefit to be derived is almost incalculable.

We want to take this opportunity to call your attention to our Philadelphia Commercial Museum, which occupies the old Pennsylvania railroad building on Fourth street, below Walnut, and that large building has been found too small to accommodate the exhibits. This museum is directly under the charge of Prof. Wilson, of the University of Pennsylvania, who has spent much time and money in collecting samples of goods, wares and merchandise from different parts of the world. Until now it is one of the wonders of the world. The city of Philadelphia has devoted two hundred and fifty thousand dollars to the advancement of this museum. The next meeting of this association, which falls on the first Wednesday of March, will be held at the museum, and Prof. Wilson will make an address, going into the subject, giving a full explanation of the purposes and objects, after which the members will have an opportunity to go through the museum and inspect the exhibits. This is a rare privilege, and we are deeply indebted to Prof. Wilson for his kind attention, and your secretary has taken the opportunity to thank him in advance for granting the privilege.

The report was on motion received and ordered to be filed.

Reports from the various sections of the price committee were next called for.

R. A. Regester, of J. Regester & Sons, Baltimore, reported for the cast iron soil pipe section, as follows:

"I am sorry to report that the bottom has dropped out of the cast iron soil pipe business. We had a pretty good depth to it

for about eighteen months or thereabouts, but we struck a snag and there is a great big hole in it. We had a combination, the western and southern makers forming one association and the eastern another; but the west and south thought they should sell in the east and the east stay at home. The east thought the other sections should stay in their own territory, and this state of things led to the end of the combination."

Thomas Glover, of Glover Bros., Frankford, Philadelphia, reported for the small grey iron castings section.

He said: "We are not doing much, and I do not think many of the small foundries are doing anything at all. There is nothing new coming in and prices are very small. I do not see anything for the future just at present. Parties in the habit of getting large quantities of work are not doing anything. We are in hopes things will be better than they have been."

Francis Schumann, of the Tacony Iron & Metal Co., Tacony, Philadelphia, for the section covering architectural work and machinery castings, said: "There is a feeling prevailing that the outlook is more hopeful. In going over the aggregate of the estimates made within the last three months, I find that it was over $1,500,000 in amount. Out of that there was probably $60,000 to $70,000 worth of work resulting. Quite recently we bid on something in New York, and cut down prices very considerably, as we were anxious to get some of the work in our shops, and we were outbidden by 50 per cent. The only class of work we can get good prices on, and it is small in volume, is where there is very strict inspection and where the man who controls the work is what might be termed cranky—where the casting is condemned if the dowel marks show and where they want the finest hair lines it is possible to obtain. They are willing to pay the price for this work, but a lot of greenhorns get in the way and their fingers are burned. In the last five years we have built something like fifteen to twenty lighthouses. Now the older builders of lighthouses are comparatively high in their prices. Every now and then a new man jumps up, who cuts prices about one-half, which disturbs things and makes us cut down prices.

That is a condition of things which can only be helped when the volume of business increases. I am free to say there are not so many of us that the volume would have to be large. The business of the last three weeks would betoken a feeling of satisfaction as to what is coming."

P. D. Wanner, of the Reading Foundry Co., Reading, Pa., for the cast iron water and gas pipe section, said: "I have nothing to say of an encouraging nature. On the contrary, what I have to say is discouraging. We thought six or seven years ago that cast iron pipe had gone away down and reached prices at which it could hardly, if at all, be manufactured. Yet prices have been going down straight along, and they are lower to-day than ever known—very much lower. The lowest price reached—and low water mark, I hope—was struck last week, when the lowest and successful bidder on work for New York bid $16.10 per net ton, delivery at New York pipe yard. That is very considerably below anything we have ever known heretofore—that is, coming from a legitimate concern of character or reputation. It is a record-breaker, and is most discouraging when we think that a trade once so prosperous should be reduced to such straits. I think the trouble all around is that we need backbone and better discretion than most of us seem to have. There appears to be demoralization. It looks as though it were a race for the survival of the fittest, and every man in the business thinks he is the fittest. I do not believe for one moment that this condition of things can exist very much longer, especially when it is known that the goods cannot be produced at these prices. There is a little consolation in the situation. Whenever the night is darkest day is near at hand. I still have hope. Hope, you know, springs eternal in the human breast, and it is a good thing it does or we could not survive these times. I believe prosperity will dawn upon us, and before the summer. I ran through the panic of 1857 and the seventies, and I must say that the last year or two have been like the period of depression of 1879, just before prosperity was reached. January of that year strongly resembled January of this year. I believe business will continue in about the same condi-

tion until late spring or summer, just as it did in 1879. Things were backward. Money was plenty and people could get it easily on good security, but there was no business. Towards spring, I remember, everything was starting up all along the line, and in July a boom set in. Pig iron advanced from $4 to $5 per ton. Before the end of that month and to the end of the year pig iron sold at from $40 to $50 per ton, and about January of that year it had been sold as low as $13. I think we are in about the same condition now, and there is no reason why prosperity should be deferred from this country for any length of time."

The hardware and malleable iron castings section was represented by Stanley G. Flagg, Jr., of Stanley G. Flagg & Co., Philadelphia. He said: "I have, as usual, nothing to say regarding my line of castings, excepting that if any of you are consumers it is a good time to buy. Business is very much demoralized."

Josiah Thompson, of J. Thompson & Co., Philadelphia, reported for the general jobbing section of the committee as follows: "Business in this line is of no account whatever. There is no sign of improvement, and I may safely say I have never seen the business in so bad a condition. In the last two weeks work that we have had for fifteen years has been taken at about half its value. The outlook is therefore a poor one. An experienced foundry foreman has stated that he could produce the castings I have mentioned at about seven-eighths of a cent per pound and make money on them, but I do not see how it could possibly be done."

Secretary Evans: "There are representatives of other branches of the foundry trade present, and their views on the situation will be welcomed."

G. A. Messick, Pusey & Jones Co., Wilmington, Del.: "The bottom has almost dropped out of our business. Were it not for our foreign trade we should not have a thing to do to-day. We are working with about a quarter of our force, and we have hopes that things will brighten up directly. We have a number

of inquiries in hand, and many of them should result in business. We have at the present time four men in Europe installing machinery."

James S. Stirling, Harlan & Hollingsworth Co., Wilmington, Del.: "We are in about the same condition, although we were favored up to about a month ago with fair business, perhaps more than we have seen for about three years. Since then the volume of business has fallen off very considerably."

A. L. Carleton, Pratt & Whitney Co., Hartford, Conn.: "I think the east is pretty much in the same boat as the west. Most of the work we have at the present time is on foreign orders, particularly in the bicycle line. Were it not for our foreign business we should be pretty dull. The prospect for the near future is not very encouraging, and we can only hope for better times. Our work is largely of a special character."

John Rohland, Cross Creek Coal Co., Drifton, Pa.: "In the coal fields business is very dull. All the foundries around us are running on little less than half time. There is nothing doing in either coal or iron. We hope we may soon see better times, but the prospect does not look bright."

G. W. Van Tine, of the Singer Manufacturing Co., Elizabeth, N. J.: "We have an output of about 7,000 machines a week, and we are still turning out that quantity. But most of our production is for exportation."

F. A. Riehle, Riehle Bros.' Testing Machine Co., Philadelphia: "We have had a fairly good year. We believe in a fair rate for castings, and if prices are not satisfactory we refuse work."

T. M. Eynon, The Eynon-Evans Manufacturing Co., Philadelphia: "Our business is scarcely five years old, and January of this year was one of the dullest months we have had. But on top of that we have now more orders in our machine shop than we have ever had. We hope within the next three months to find the volume of business double what we have ever had in any like period."

Treasurer Thompson then handed in his report, and the same was read by the secretary. The report showed a balance in hand of $1,395.02 and all bills paid.

Secretary Evans: "We have been trying to find some system that would come up to the requirements of the law and prove acceptable to our members, whereby certain information could be obtained in regard to buyers of castings. It seems to be a fact that there is a good deal of money lost in the jobbing shops, where customers, having exhausted their credit with one foundryman, open accounts with others. The foundries who continue the credit of course are not in a position to know of the customer's standing with the first foundry, or they would certainly not extend the credit asked. A credit system has been considered by your executive committee, and the following resolution passed at its last meeting:

"That the members of this association should feel at liberty to seek any information either through their fellow members or through the medium of the secretary. In other words, should a member of this association feel that he is being imposed upon by a customer who has exhausted his credit and gone to another foundry to draw his supply, he can procure certain information in this way. The nature of this association is to a certain extent protective, and those who join do so for the purpose of improving their condition. We trust, therefore, the members will appreciate this fact and assist each other as far as possible in matters of this kind."

President Wanner: "We had that question up some years ago, and it was decided that it would not be proper to make a credit bureau of this organization, and that by virtue of our coming here and getting acquainted with each other for the best interests possible in the trade we could do for each other personally in that direction better service than by inaugurating a system, the propriety of which was very much doubted."

Secretary Evans then brought up the matter of investing part of the surplus fund in the hands of the treasurer.

After some discussion, participated in by Messrs. Evans, Wanner and others, a motion made by Mr. Glover to invest $1,000 in the bonds of the Manufacturers' Club was carried.

Geo. W. Moore, Philadelphia, inventor of a new cupola breast to take the place of the old sand breast, then exhibited and described his invention. Following is his description:

"A breast is a very important factor in the transmission of iron, yet one of the smallest considerations in its manufacture. This breast is to do away with the old style clay breasts, which have always been a source of annoyance to foundry foremen, not only by their having to put in a new one for each and every heat, but sometimes before the heat is completed. With this breast there is no cause for anxiety. When properly placed the heat can be run with uniform flow, until the supply is exhausted; and can be stopped off when necessary by a stopper of the same material, which cancels the use of clay plugs and tapping bars.

"When dropping the bottom you always close the tap hole. When slag accumulates it can be easily removed, as it will not adhere to the breast. By careful manipulation this breast will last from three weeks to three months. Care should be exercised in its adjustment. Place the breast within one inch of the inside of cupola, and after the blast is started, keep the top hole closed until sufficient iron is melted to rise above it. The tap hole is regulated accordingly. A one-half inch hole will run five tons per hour, a five-eighths inch hole ten tons and a three-quarters inch hole about fifteen tons. This breast has been tested by all kinds of metal, and has proved successful in all cases. It has been used by Stanley G. Flagg & Co. in both cupola and furnace for the past year."

The breast was made chiefly of plumbago, and the cost of one for a ten-ton cupola was, Mr. Moore said, $1.50. The breast was examined with much interest by those present.

James Christie, M. E., of the Pencoyd Iron Works, Philadelphia, then read a paper on "The Drop Test for Cast Iron." The paper was as follows:

"The object of these few remarks before the practical men who compose the Foundrymen's Association is to impress on them the value of the drop test, as a simple method, and one quite readily accomplished, for determining the most desirable resisting properties of cast iron. To make a complete study of the subject, the testing room should be equipped so that tension tests, transverse pressure tests and transverse drop tests can be made on standard specimens. The chemical analysis of each should be recorded. A record of shrinkage and other physical properties should be tabulated. However desirable all this is, it is too much to ask of the overtaxed foundryman, who prosecutes his business in a humble way. Let us be satisfied to ask him for one test that can be readily obtained with inexpensive devices, but insist that this one test will afford the best criterion of the suitability of the metal for its intended purpose.

"The effects of impact or percussion and shock are the most destructive forces materials have to endure. They are rarely absent in any service to which iron is subjected. Cast iron is the most treacherous form of the metal, and the most variable in its resistance to dynamic forces. Therefore, the material that offers the most effective resistance to the fall of the drop will probably represent the metal most generally useful for the manifold purposes in practice. It is generally recognized that high tension alone is not a safe guide, and it has become customary to rely on transverse strength and deflection, as obtained by static pressure, as a surer exponent of the resisting qualities of the metal.

"In the early experiments of Hodgkinson he assumed, on what appears to be insufficient evidence, that the breaking load multiplied by the maximum deflection of the specimen afforded a comparative estimate of its resistance impact. There are reasons to believe that static stress of any kind and for any class of iron is not always a correct indication of its ability to withstand dynamic forces. A well-known illustration of this appears in high phosphorus steel, when the metal may yield satisfactory results in the static test, but is dangerously brittle when subjected to sudden impact or percussion. There are reasons to believe that this is

frequently true also for cast iron, and the writer hopes at some future time to present some experimental data on the subject, which are not in proper shape for presentation now.

"For drop testing it is proposed to use test specimens of a standard dimension and placed on supports a standard distance apart, as in the pressure test, and subject them to the action of a falling tup of a standard weight, and striking the specimen exactly in mid length, similar to the well-known test for axles, rails, etc., both on a smaller and perhaps more precise scale. The blow should be begun well below the breaking point, and the height of fall gradually increased until the specimen breaks, the deflection for each successive blow being recorded. The device required for testing is of the most simple character. A bed plate bearing supports for the specimen, and carrying a pair of vertical rods, on which the tup slides, all surmounted with a lifting attachment for raising the tup and a trigger hook, which permits an instantaneous release of the tup. A rigid pencil attached to the tup will record on a tablet the amount of deflection, although the determination of deflection is not so important with the drop test as it is with the pressure test.

"For specimens one inch square and twelve inches between supports, a weight of 200 pounds falls approximately three inches to break ordinary cast iron, so it will be seen that the apparatus required is quite small and inexpensive.

"These suggestions are offered as aids, not hindrances, to the successful operation of the foundryman who does not use his own castings. For the more intelligently he uses his material the better the satisfaction to the customer and the higher the place occupied by his business in the industrial arts."

Mr. Christie made some few remarks supplementary to his paper leading up to the opinion which he expressed that the drop test might be considered as the surest and best criterion of the useful properties of cast iron.

Mr. Schumann "I fully concur in what Mr. Christie has embodied in his brief paper. My observation is that any part of a machine which gives way under a blow—it may be one heavy

blow or a multiplicity of minute blows—is worthless. A wheel or a bell always breaks under a heavy blow; therefore we should test the material for something similar to that blow. Supposing we had a cast iron girder, which is out of date at this time, but assuming it is still used, the fact of moving over the floor supported by it a big safe or other heavy article makes a blow, or is a strain similar to a blow. I have already worked distinct from Mr. Christie with a view to having the impact test generally used for testing cast iron. I have found that of two castings made from the same mixture the one cooling slowly would sustain a greater impact test than the one cooling quickly. The true way to test any casting used in a machine is by impact, because it is similar in its results to the forces that the casting would be subjected to, and because any machine is subject to, as I have said before, either a multiplicity of small blows or a less number of heavy blows."

Mr. J. S. Whitney: "There is one case in which the impact test has been found not to cover every contingency. The railway companies have adopted a drop test for car wheels which is very general now. Although the wheel in practice does not get a blow on the hub in running, that test would develop the strength of the metal in it and was considered a satisfactory test. In the last three or four months it has been decided that that test does not meet all cases and there has been introduced a new test which is called a thermal test. They find that when the brake is put on wheels they become heated and some wheels stand the expansion better than others. In order to see how wheels would stand that condition a practice has been adopted and specifications issued requiring some of the wheels offered for test to be subjected to the thermal test. A wheel is laid on the ground flat, and a sand mold put around it and hot metal poured in to the width of the wheel. There are, say, two wheels subjected to that test out of every hundred. If the wheels stand that test without breaking in two within a certain time, then the 100 wheels pass. One wheel is offered for the drop test. This is a case where the drop test does not meet all contingencies."

Mr. Schumann: "But the drop test has not been abrogated."

Mr. Whitney: "No."

Mr. Schumann: "I have often seen the brakes put on a train when coming round a bend and the wheels get almost red hot, and it has always been a wonder to me that they did not break."

Mr. Davis: "I understand that Mr. Christie used a square bar. Mr. Asa Whitney, in his paper read at the last meeting, described how he had discarded the square bar and used a hexagon bar. Would the shape of the section make any difference?"

Mr. Christie: "No. It has been customary for some years to use a square bar, and it is better to have a uniformity of section. The test can be made, of course, just as well on any section. The relations I spoke of are made on square bars."

Mr. J. S. Stirling then read the following paper by John Rohland, superintendent of the Cox Iron Manufacturing Co., Drifton, Pa., in answer to the question, "Are Apprentices of Any Value at All to Foundrymen."

"I find with us here at Drifton, the only way to get molders is by apprenticeship. After three months these young apprentices become valuable, and by taking pains with them they can do the ordinary molding after six or eight months. At the end of two years they become very proficient in their work, and at the end of the fourth year they do very good molding—that is, on general work. My experience for the past ten years in the foundry, machine, boiler and car shops, is that the only way to get molders or machinists to do the class of work that needs to be done is to bring them up with your business. I also find that those apprentices who attend night school make the brightest and best molders or machinists, and those that do not take a liking to school only make ordinary molders or machinists. We have with us at Drifton 44 apprentices in our different shops, and I find them all useful young men. I do not think that the trade school can turn out as good a molder or a machinist as an apprentice brought up in the machine shop. The opportunity is

not afforded in the trade school to observe the different class of work which may be going on. Apprentices in the shop can readily see how it is done from observation while at some other class of work."

Secretary Evans: Here is a subject for discussion. I have here a phosphor bronze casting sent by the Florida Machine Works, Jacksonville, Fla. Three sides have been planed off and show blow holes. The other side is unplaned. They want to know why they cannot make these castings without blow and shrink holes. They have taken every precaution to prevent them --have poured fast, slow, hot and cool, used different kinds of sand, fine and coarse, and are unable to overcome the difficulty. They ask whether the members of this association can explain the difficulty.

On motion of Mr. Devlin, the sample was referred to W. C. Henderson, a chemist, for consideration.

PROCEEDINGS OF THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, February 17, 1897, at the Great Northern Hotel, Chicago. The president, A. W. McArthur, presided.

The secretary read the amendments proposed by the by-laws at the preceding meeting, and also the corresponding by-laws as not amended.

A motion was duly made and seconded to consider these proposed amendments section by section. This motion was carried, and the association proceeded to their consideration.

There was some discussion on these amendments, but on motion duly made for each section the proposed amendments were all rejected. The vote against the amendments was thoroughly unanimous, and after the same had been disposed of the president made a few remarks calling attention to the unanimity of sentiment in rejecting the proposed amendments and asking that since they were now disposed of and the association had shown its desire to work under the by-laws, every member should put his shoulder to the wheel and labor conscientiously for the good of the association and the advancement of its objects.

The president then stated that the next business in order was the discussion of topical question No. 8, which reads as follows: "What is the proper amount of air and pressure of same to melt iron in cupola, and what are the effects of too little and too much air?"

Mr. Sorge said that in the proportioning of tuyere areas for cupolas and the size of blower necessary the ordinary practice is to assume a consumption of 2,500 pounds of air for 2,000 pounds of iron melted. This is on the assumption of about 8-ounce blast pressure and a melt of seven pounds of iron per pound of coke.

Mr. Smith—As to the exact weight and pressure of blast required in a cupola I have no actual figures, and I believe that any figures assumed are merely theoretical. My experience is that eight ounces is about the best blast pressure. In one foundry with which I was connected we used a No. 7 Sturtevant fan running at 2,200 revolutions, but a No. 8 fan running at 2,000 revolutions, or a No. 9 fan running at 1,900 revolutions, would accomplish the same purposes. Too little blast does very little harm, but too much blast is liable to do considerable harm. Particularly is this the case at the beginning of the heat and especially with soft iron. Excessive blast melts faster, but produces colder iron and has a tendency to harden same. My experience is that the iron coming from the cupola is usually hard at the beginning of the heat and gets softer later, even where the same charges are used right through.

Mr. Pettigrew—For many years I used a 48-inch cupola which had eight 5-inch round tuyeres and used a No. 7 Sturtevant blower running at 2,300 revolutions, producing a blast pressure of nine ounces. My experience is that when the cupola is dry and in good shape the iron is softer at the beginning of the heat. In car-wheel foundries where heats of 36 to 40 tons are taken off, they charge more hard iron in the middle of the heat than either at the beginning or at the end.

Mr. Dalton—In my experience I have seen cold iron come at the first tap of the cupola, while the iron became hotter as melting continued. I believe, however, that this was due more to the condition of the cupola than to the amount of air used.

Mr. Smith—The iron in the cupola trickles through the charge in a similar manner to water trickling through a sponge, and when an excessive amount of blast is used the iron is exposed to the action of the oxygen in the air, and there is a tendency of hardening the iron by burning out some of the silicon. I have also found that an excessive amount of air chills the charge at the opening of the tuyere, thus preventing good circulation of the air through the charge in the cupola, and consequently also preventing thorough melting.

Mr. Coffeen: I have had some experience with the melting of iron for car-wheels. Where I worked we found it necessary to use more softeners at the beginning of the heat than later, as we invariably had harder iron at the first tap than at subsequent ones.

Mr. Hanna—We have a 32-inch, a 40-inch and a 60-inch cupola. We use 15 to 16 ounces blast. In the 32-inch cupola we melt about 4 tons per hour, in the 40-inch about 6 tons per hour and in the 60-inch about 12 tons per hour. Into the 32-inch cupola we blow 3,520 cubic feet of air per minute. Into the 40-inch cupola we blow 5,480 cubic feet per minute, and into the 60-inch cupola we blow 7,920 cubic feet per minute. The 32-inch cupola runs on hard iron for chilled work. The other two run on grey iron. If 2,500 pounds of air melts 2,000 pounds of iron, we are using a very excessive amount of air.

Mr. Ferguson—I cannot tell just what the quantity of air is that should be used, but I know that I use as much air as I possibly can. I never had too much. It may be that the engineers in designing a plant so proportion the blowers that we could not get an excess, but up to the limit of the blower capacity I want all the air that can be obtained. As I increase the amount of blast, I find that I increase the speed of melting. I find that our iron is harder at the beginning of the heat than later, and I know that car-wheel foundries have the same experience.

Mr. Smith—Mr. Ferguson's class of work and mine are very different. He makes heavy gray iron castings, while I make very light work. This may possibly explain why our experience varies.

Mr. Dalton—I find that we never get too much air, and I need very hot iron to do the work in our foundry. But my experience shows that I get cold iron with too little blast.

Mr. Ferguson—About ten years ago I experimented with low-blast pressure to my heart's content. In a 30-inch cupola with 8 ounces of blast I melted at the ratio of 1 to 7, my heats being from 3 to 5 tons easily. I reduced the blast pressure daily and

also the amount of coke until I melted with a 4-ounce blast and the ratio of 1 to 11½. I then stopped, as I found that my iron was growing too cold.

Mr. Sorge—When the blast pressure is reduced the volume of air should be increased, and therefore the area of the tuyere openings into the cupola should be correspondingly increased. It is my opinion that the blast pressure employed by Mr. Hanna is too high for economical results, and that he would do better by using a lower pressure and increasing the amount of opening into the cupola through which the air is introduced. Where the air issues into the cupola under a very high pressure and through a comparatively small tuyere area, it acts upon the fuel something like a blow-pipe, produces intense heat at one spot and burns away the coke rapidly, thus leaving holes through which afterwards the cold air enters and thus reaches the center of the cupola. In my opinion a large volume of air with low intensity of blast is preferable to a small volume of air with high intensity.

Mr. Thompson—I find that one difficulty in judging of the air pressure is that the blast gauge does not tell the story unless you use a positive pressure blower. Where a fan is used the amount of air delivered is not a positive quantity. We have a 54-inch Colliau cupola lined up to 48 inches. With a No. 6 Root blower, delivering about 46 cubic feet per revolution or 8,000 cubic feet per minute, we melt from 12 to 13 tons in a heat and use about 40,000 cubic feet of air per ton. We consider this a rather large amount. We get no colder or hotter iron by using more blast, but my experience is that we simply melt faster.

Mr. Carter—I am not a foundryman and am not familiar with cupola work. However, I have gone over some of the figures given, and I do not find a very great difference. Mr. Sorge thought 2,500 pounds of air per ton of iron is used. Mr. Thompson's figures show that he used about 3,000 pounds. Mr. Hanna shows that he used about 4,000 pounds of air for a 32-inch cupola, about 4,100 pounds for the 40-inch cupola and about 3,000 pounds for the 60-inch cupola. There is therefore very close

agreement in these figures when you consider the difference in blast pressure employed.

Mr. McArthur—It appears to me that the amount of air needed for melting depends largely upon the character of the fuel employed, and I should like to hear from some of the members on the subject.

Mr. Jackson—I think the physical structure of the coke used in melting iron has considerable to do with the quantity and intensity of blast employed. Where the coke is soft, less blast pressure is needed and a greater volume than when the coke is hard. This will then necessarily involve a larger tuyere area for soft coke than for hard coke.

Mr. Hanna—I do not think a fan can be relied upon for cupola work, but that a positive pressure blower is needed. The best results that I have obtained were with a 30-inch cupola, having a 2-inch annular tuyere extending clear round the cupola and in which I used 10 ounces blast pressure and melted 5 tons per hour. I believe that low pressure and large volume of air are desirable when the cupola can be so constructed as to get sufficient tuyere area. There are practical difficulties about getting a sufficiently large tuyere area.

Mr. Ferguson—They tell us that theoretically we should melt 20 pounds of iron to one of coke, but actual results show that on the average we do not exceed 8 to 1. Does this not show that we are not getting enough air?

Mr. Sorge—I hardly agree with Mr. Ferguson in this proposition. The small proportion of iron melted per pound of fuel is due to the fact that after the fuel is consumed in the melting zone of the cupola the gas passes up through various layers of fuel and the carbon dioxide, which is the product of perfect composition, is transformed in the carbon monoxide by the absorption of more carbon. The heat value of this carbon monoxide, or, in other words, the amount of heat produced by burning of the fuel improperly is very much smaller than that produced by burning the fuel perfectly and forming carbon dioxide. In other words,

we are getting in the cupola imperfect combustion, and are permitting a large portion of the heat value of our fuel to pass out of the stack. This is the reason why the amount of iron melted in the cupola is so much smaller than theory tells us should be the case.

Mr. Hanna—I think that usually it is more economical to sacrifice fuel in order to save time and other expenses running the cupola.

Mr. Carter—I have made a few more figures in the cupola mentioned by Mr. Hanna. In the case when 4,100 cubic feet of air were consumed I find that there were about 20 pounds of air used per pound of carbon in the fuel, while they were melting at the ratio of 10 to 1. The theoretical consumption of air would be 13 pounds per pound of carbon.

Mr. Ferguson—I believe we need more air in our cupola, and think we should therefore have larger blowers and more tuyere area.

Mr. Pettigrew—I regret that Mr. Moore, of Joliet, is not here, as he has had experience in this line, which is very interesting. He has a Colliau cupola which was fitted with the usual tuyeres. He formerly used Connellsville coke entirely. During the strike in 1887 he had great difficulty in getting his coke, and finally was obliged to purchase coke of a different character and what he considered of inferior quality. He was unable to melt his iron properly, but he finally took out the Colliau tuyeres and cut out large openings, simply increasing the tuyere area in his cupola. He reduced his blast pressure and increased the volume of air, and since then has had no trouble whatever to get hot iron in good condition from soft coke.

Mr. Jackson—I believe that one difficulty is that foundrymen are frequently not accurate enough, not knowing the conditions under which they work. Some time since I met two foundrymen running cupolas under like conditions and fitted with the same kind of apparatus. I asked one what blast pressure he used.

He stated that he did not know, but that he ran his gauge up to two inches, which he thought was about 13 ounces. The other had the same kind of gauge, cupola, etc. He told me that he ran his gauge up to two inches and that his pressure was eight ounces. I only said this to illustrate that frequently foundrymen believe that they are working under conditions different from what actually exist.

PROCEEDINGS OF THE NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The regular meeting of the New England Foundrymen's Association was held at the United States Hotel, Boston, February 10. After the business of the evening had been transacted the vice-president, Walworth O. Barbour, furnished a paper on what methods should be pursued to further the interests of this association, and to make it a source of definite profit and pleasure to its members, which was discussed by those present.

PROCEEDINGS OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The Pittsburg Foundrymen's Association met at the Builders' Exchange February 22. Owing to the inclement weather and the consequently limited attendance, it was decided to postpone the regular order of the meeting one month, when efforts will be made to secure the attendance of all foundrymen in Pittsburg and contiguous territory.

A REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

AMERICAN MACHINIST.

George W. Dean illustrates a method of molding hawse pipes from a pattern longer than the intended casting. A complete description accompanies the illustrations.

The pig iron and coke hoists as operated by the Lane & Bodley Co., of Cincinnati, O., are described in a subsequent number. Between the piles of iron and coke and the building is a track, which by an incline rises to the level of the cupola-charging floor, when by a curve it enters the building and passes in front of the cupolas. A small car runs on this track, and by a hoisting rope is hauled up the incline and into the building, while a tail rope draws the empty car back to the lower level. This car is fitted with a pair of platform scales, by which the iron is weighed and the mixture determined in the process of loading. The car is simply brought to the pile containing the kind of iron wanted, when the desired quantity is loaded and weighed at the same time, and then hoisted to the charging floor and dumped.

THE IRON AGE

One noticeable feature of foundry construction at the present day is the tendency to provide all the facilities that will in any way tend to decrease the cost of the finished product. A few years ago there was considerable similarity between all foundries, which is now giving way to specially designed buildings calculated to best serve the peculiar conditions to be met in each locality.

One of the latest examples of current practice is the new shop of the Sessions Foundry Company, located at Bristol, Conn., of which a complete description is given in The Iron Age of February 18, accompanied by twenty-two illustrations of the different departments.

THE FOUNDRY

S. S. Knight, in comparing mechanical and physical tests, offers an analysis showing that phosphorus, when exceeding a certain per cent, is not distributed evenly throughout the casting.

In concluding the paper Mr. Knight says:

"Shrinkage, chill and strength are all due to molecular arrangement within certain quite broad limits, and it is only as composition affects these that chemical analysis is of value. Since molecular arrangement is so active in the production of the beneficial or baneful properties of iron, it is possible that some chemical or mechanical process may be devised which it will be possible to give irons that are weak from the excess of some elements or lack of others strength. This has been done on a small scale by tumbling and on a larger by the familiar process of annealing in the presence of some chemical, as it is now done in the malleable iron foundries. The influence of small quantities of silicon and excessive sulphur may be either wholly or in part overcome by the addition of such qualities of aluminum as from one-tenth to one-fifteenth of a per cent.

"Under no conditions should these two classes of tests be alienated, and only as each is used to the mutual advantage of the other will the most rapid advancement be attained."

A greater familiarity with stove plate scrap would undoubtedly enable many foundries to use this material to good advantage. Charles Johnson, in writing of "Stove Plate Scrap," says:

At one time I deemed it necessary that I ought to know the analysis of stove plate scrap. In order to get at this result I melted by itself five tons of stove plate scrap just as it came from the pile and poured the same into pig beds; at the same time I made a one-inch test bar from this mixture. I then took from different parts of the pig bed twelve pigs and drilled them. I then mixed the drillings and had the drillings analyzed with the following results:

Combined carbon	.96
Manganese	.21
Silicon	2.86
Phosphorus	.938
Sulphur	.123

The one-inch bar made from this mixture resting on knife edges 12 inches apart, at the extreme ends showed a breaking strain of 2,850 pounds. This mixture made a very close grain iron.

You will observe by the analysis that the combined carbon was very high (which would make a close grained iron). The silicon is high enough to make the iron fluid. The phosphorus about right to make the iron remain fluid so that this mixture alone would run thin castings.

The above analysis shows high enough in silicon to produce castings of sufficient strength and softness when mixed with the right pig iron.

Mr. Johnson further demonstrates that for many purposes it is superior to machinery scrap, and that there is less loss from shrinkage in using it than is commonly found in pig iron.

W. J. Keep answers several questions relating to iron and fuel. He estimates that the loss in melting will vary from 2 to 5 per cent, according to the condition of the material used and the honesty of the melter in reporting weights.

Regarding "Black Heads" in coke, Mr. Keep says that "for foundry use 72-hour is preferred rather than 48-hour coke. Black heads are partially coked coal, and I never heard it claimed that they were as good as coke. If each car contains the proportion of black heads that came from the oven in 72-hour coke there would not be enough to influence cupola melting."

THE INDUSTRIAL WORLD.

In a series of articles on "Modern Foundry Practice" a writer, styling himself "Ferro," gives voice to the following:

Twenty-five years ago it was customary to look to England or Scotland for our foundrymen, and they were picked men who

had to serve a seven-year or more apprenticeship. At that time it was an essential feature that he should have a thorough knowledge of the manipulation of iron in both light and heavy work in all their details. But the present practice is radically different, and the foundry foreman, like the molder, has developed into a specialist, although he is no less a mechanic.

Molding, to most eyes, is seen only as a dirty trade, in which nothing but brawn and muscle are required, and the mechanic in his line is no better in the sight of the general public than the dirty-faced molder. Very few writers take iron and its different processes of manufacture as a subject, probably owing to the fact that they who follow the foundry business and have a thorough practical knowledge of it, are not adapted to putting their thoughts upon paper. In the case of most foundrymen, they have not the time to devote to writing. We are, as a class, very selfish when compared with other trades. When a molder hits upon a new idea, he generally shows it to a few of his shop-mates for self-aggrandizement and there it ends. In other trades, when a mechanic runs across something new, there is generally some one who will generally get it into print, and it becomes a help to his fellow-craftsmen, wherever they may be.

MACHINERY

The method employed in constructing molds for heavy planer beds at the foundry of the Niles Tool Works, Hamilton, O., is illustrated by Peter J. Connor. Some novel features, sanctioned by an extended experience, are described. The same journal contains an article on "Brass Foundries" and what is considered some of the latest conveniences for turning out work in this department.

THE MECHANICAL REVIEW.

Manchester, Eng.

In writing of the latest workshop practice Joseph Horner illustrates what he considers the best methods for arranging the interior of foundries, showing the distribution of cranes, cupolas,

etc., in a manner calculated to promote the most rapid and economical handling of materials. He also advocates that where there are specialties to be made, as there are in most cases nowadays, each should be confined to a separate department. This is simply an extension of the principle of keeping in a general shop certain men on certain classes of jobs.

THE TRADESMAN.

In speaking of cupola practice and the great diversity of opinion brought forward whenever this question is under consideration this journal says:

"It is not at all strange that these opinions differed widely. Some years past cupola practice has been frantically racing after theoretical perfection in the economy of fuel in melting iron. Many a foundry has lost $100 worth of castings trying to save $10 worth of fuel. Many another foundry has, little by little, reduced the proportion of coke till at last, some day, for the first and last time, ten or twelve of iron to one of coke has been melted successfully from an economic standpoint and immediately the fact is rushed into print. Many a writer on foundry topics is looking for a good foremanship, and he doesn't dare admit his inability to melt anywhere from ten to fifteen of iron to one of coke, because others claim to do these things, and if he can't nobody wants him.

"Make a tight-jointed caisson of strong iron, provide for the right volume of blast at the proper height from the sand bottom, to be introduced through tuyeres of any shape, round, oval, oblong, three-cornered or all shapes in the one cupola, and have the charging door at the height indicated by experience to be best, and your cupola will be a first-class article. If the cupola is not a very large one the walls should be perfectly vertical; but if large reduce the diameter reasonably from the bottom of the melting zone down.

"When you read of some one who claims to be melting twelve or fifteen pounds of iron to one pound of coke, don't lose any sleep because you are not doing the like. Understand that the

conditions that environ him are probably very different from those that you have to meet. You may be melting all pig iron, and he may be melting 60 per cent of scrap. You may be taking off light heats, and he may be running his cupola to its proper capacity. You may be obliged to have good hot iron from beginning to end of heat, while he may not need iron to be heated much beyond the fusing degree."

In advocating the formation of a Southern Foundrymen's Association The Tradesman calls attention to some of the many benefits that can be conferred only by association and which are beginning to appear as a result of the organization of the earlier societies. The following is a short abstract from its pages:

"It goes without saying that if these associations were not financially profitable to their members they would not so multiply, and that, too, during a period of extreme business depression.

"The foundrymen's association affords a school wherein more of modern, up-to-date foundry practice can be learned in a very few days than would be acquired in years of isolated endeavor.

"The foundrymen of the south are not in possession of the business of the south. It is quite true that some of our foundries are getting their full share of trade, but the fact remains that the northern manufacturers are supplying immense quantities of cast iron product to the southern trade.

"Only yesterday, in discussing with a well-known foundryman the advantages to accrue from the Foundrymen's Association, he averred that he could not in his foundry produce castings of such perfect finish as characterize those that are shipped here from abroad. These castings come from a section where the associations have been getting in their educational work.

"There is nothing that so brightens a man intellectually as contact and association with men of intellect. There is nothing that so amply qualifies a man for the prosecution of his vocation as frequent and candid discussion of methods with men of the same calling. And this applies to sections of country as well as to the individuals of the section. By exchanging our experiences we multiply our knowledge."